part of the Ichthyic and Batrachian bone; but just as this coalescence begins, ossification proceeds inwards from these "parostoses," and affects the overlying cartilage, the cartilage of the basisphenoidal region having no other osseous nuclei. This process of the extension inwards of ossification from a splint-bone to a cartilaginous rod or plate I have already called "osseous grafting"*.

In my former paper the basisphenoidal "rostrum" and "basitemporals" were classed with the endoskeletal bones; they will in the present paper be placed in the parosteal category, in accordance with their primordial condition.

By the careful following out of these and numerous other details I have corrected and added to my previous knowledge of the early morphological conditions of the Bird's cranium, and at the same time, I trust, have contributed to an enlarged and more accurate conception of the history and meaning of the Vertebrate skull in general.

II. "Determinations of the Dip at some of the principal Observatories in Europe by the use of an instrument borrowed from Kew Observatory." By Lieut. Elagin, Imperial Russian Navy. Communicated by Balfour Stewart, LL.D. Received February 2, 1869.

Before I give a short account of the observations and the results deduced from them, I beg to express in the first place my best thanks to Dr. Balfour Stewart, Director of the Kew Observatory, who, having heard of my desire to take the dip at different places, was so kind as to lend me an instrument from the Kew Observatory,—also to James Glaisher, Esq., F.R.S., &c., who furnished me with a tripod-stand, which I found to be of great use to me on some stations.

I may also remark that, having other duties to perform in obedience to instructions from the Russian Government, I could only devote a portion of my time to the observations of dip.

The instrument I had from Kew Observatory was one of Barrow's Dip-Circles, furnished with two $3\frac{1}{2}$-inch needles in the form generally used at the Observatory. The Dip-Circle used had been in use for some time at the Kew Observatory, until, it having been ascertained that one of its needles was somewhat deteriorated, it was replaced with that now in use.

Before I left Kew Observatory I was aware that one of the needles was not as good as might be desired; but as Mr. Stewart had no other circle suitable for my purpose, I considered it desirable to take this circle.

The observations were made according to the instructions of Lieut.-General Sabine, given in the 'Admiralty Manual of Scientific Enquiry.'

The following Table I. shows the results of the observations with the circle from Kew; in it the name of station and the date of observation are

* See memoir "On the Shoulder-girdle and Sternum," Ray Soc. 1868, p. 10.

mentioned in the first column; in the second column is noted the particular needle used, and whether in the first series of observations the marked end or "N. Pole" was dipping, in which case it has been indicated by the word "direct;" in the case when the opposite or "S. Pole" was dipping first, it is indicated by the word "reversed." Under the head of marked end, each of the two results is that formed from the mean of four sets of observations; in one of these two results the marked end is made a north pole, and in the other it is a south pole. The headings of the remaining columns explain themselves.

TABLE I.

Station and Date.	Needle.	Marked end. N. Pole.	Marked end. S. Pole.	Means of the two results.	Means of separate Needles.	Means of both Needles.
1868.						
Kew Observatory (Magnetic House).						
d h		° ′	° ′	° ′	° ′	° ′
August 4 2	A_1 direct.	67 59·50	68 7·80	68 3·65		
,, 5 0·5	,,	68 12·37	67 50·12	68 1·25	68 2·55	
,, 5 23·0	,,	68 9·50	67 57·00	68 3·25		68 3·87
,, 7 2·0	,,	68 4·12	68 0·00	68 2·06		
,, 5 2·5	A_2 direct.	68 9·40	68 3·20	68 6·20	68 5·20	
,, 6 0·0	,,	68 10·20	67 58·20	68 4·20		
Royal Observatory, Greenwich (Magnetic Offices).						
August 7 23·5	A_1 direct.	68 9·25	67 51·30	68 0·27		
,, 8 3·5	,,	68 6·25	67 44·38	67 55·32		
,, 9 23·0	,,	68 13·12	67 49·88	68 1·50		
,, 10 2·5	,,	68 2·81	67 47·77	67 55·09		
,, 10 3·5	A_1 reversed.	68 4·69	67 47·77	67 56·23		
,, 10 22·5	A_1 direct.	67 59·50	67 52·06	67 55·78		
,, 11 3·5	,,	67 58·19	67 52·22	67 55·33	67 58·25	
,, 11 22·0	,,	68 5·56	67 49·12	67 57·34		
,, 12 22·0	,,	68 10·42	67 55·25	68 2·83		
,, 13 0·5	,,	68 6·60	67 55·10	68 0·85		
,, 13 2·5	,,	68 5·60	67 44·70	67 55·05		67 58·88
,, 14 0·5	A_1 reversed.	68 5·11	68 0·45	68 2·93		
,, 14 22·5	A_1 direct.	68 6·59	67 49·00	67 57·84		
,, 10 23·5	A_2 direct.	68 3·50	67 55·38	67 59·44		
,, 11 23·5	,,	67 58·75	68 0·12	67 69·43	67 59·51	
,, 15 0·5	,,	68 2·12	67 57·19	67 59·65		
Norwich (Mr. Firth's garden, St. Giles Street).						
August 18 20	A_1 direct.	68 30·8	68 13·4	68 22·10		
,, 21 3·5	,,	68 17·0	68 5·6	68 11·30	68 16·93	
,, 24 20·5	,,	68 24·4	68 10·5	68 17·45		68 17·94
,, 21 3·5	A_2 direct.	68 22·50	68 13·9	68 18·20	68 18·95	
,, 24 20·5	,,	68 20·50	68 18·9	68 19·70		
(Mr. Gibson's garden, Bethel Street).						
August 24 23·0	A_1 direct.	68 23·19	68 9·37	68 16·28	68 16·28	
,, 24 23·0	A_2 direct.	68 23·12	68 15·50	68 19·31	68 19·31	68 17·86

TABLE I. (*continued*).

Station and Date.	Needle.	Marked end. N. Pole.	Marked end. S. pole.	Means of the two results.	Means of separate Needles.	Means of both Needles.
1868. Brussels Observatory (Magnetic House).						
August 31 23	A_1 direct.	67 15·22	66 59·12	67 7·17		
September 2 0	,,	67 10·55	66 58·42	67 4·48	67 5·67	
,, 4 6	,,	67 6·70	67 4·00	67 5·35		67 6·77
,, 1 3	A_2 direct.	67 5·10	67 4·45	67 4·75		
,, 1 23	,,	67 18·10	67 4·90	67 11·50	67 7·87	
,, 2 4·5	,,	67 14·00	67 5·67	67 9·83		
,, 4 5·0	,,	67 5·90	67 5·60	67 5·75		
Utrecht Meteorological Observatory (Magnetic House).						
September 9 0	A_1 direct.	67 50·2	67 29·0	67 39·6	67 40·6	
,, 10 0	,,	52·4	30·5	41·5		67 43·3
,, 8 2	A_2 direct.	67 49·8	67 38·8	67 44·3	67 46·0	
,, 8 23	,,	49·8	45·4	47·6		
Vienna (Theresianum Garden, Magnetic House).						
September 19 0	A_1 direct.	63 42·7	63 24·8	63 33·75		
,, 19 4	,,	47·1	29·2	38·15	63 36·2	
,, 21 0	,,	44·0	29·7	36·80		63 38·8
,, 19 0	A_2 direct.	63 44·3	63 40·5	63 42·40		
,, 19 4	,,	43·3	41·05	42·18	63 41·40	
,, 21 0	,,	42·3	36·80	39·60		
Munich Observatory (Magnetic House).						
September 29 22·5	A_1 direct.	64 11·7	63 53·9	64 2·8	64 3·9	
,, 30 3·5	,,	19·9	50·1	5·0		64 7·7
,, 29 3·5	A_2 direct.	64 13·0	64 11·0	64 12·0		
,, 29 22·5	,,	14·9	6·9	10·9	64 11·5	
,, 30 3·5	,,	12·2	11·1	11·7		
Paris Observatory (in the garden close to the Magnetic House).						
October 14 22·5	A_1 direct.	65 55·7	65 36·7	65 46·2		
,, 16 23·5	,,	54·6	39·8	47·2	65 48·4	
,, 20 1·0	,,	2·2	41·7	51·95		65 49·85
,, 14 22·5	A_2 direct.	65 55·1	65 45·2	65 50·20		
,, 16 23·5	,,	53·4	48·2	50·80	65 51·3	
,, 20 1·0	,,	56·95	48·55	52·75		
Royal Observatory, Greenwich (Magnetic Offices).						
December 3 2	A_1 direct.	68 11·0	67 50·0	67 0·5	67 58·7	
,, 7 22	,,	68 3·5	67 50·0	67 56·8		67 58·0
,, 3 2	A_2 direct.	68 10·9				
,, 7 22	,,	68 1·1	67 54·4	67 57·2	67 57·2	

At the Royal Observatory, Greenwich, I took more observations with one needle than the other; and the reason for that was, I found that this needle, A_1, gave two distinctly different positions: for instance, at times

dips were found which differed from those obtained at other times about seven minutes, whilst the other needle, A_2, gave more uniform and satisfactory results; and this is also the reason I preferred to take the separate means for each needle, and then means of both needles, and to give to them equal weights, notwithstanding the number of observations is greater in one case than the other. The cause of needle A_1 giving different positions must be most probably in the axis of the needle, not in the agate plates; otherwise both needles would indicate the same difference.

Having given the results of my observations, I think it desirable to state the precautions I took to obtain the best results. First of all, whilst at the Royal Observatory, Greenwich, where I was for several months studying the several instruments in the magnetic department, through the kindness of the Astronomer Royal and Mr. Glaisher, I had made myself well acquainted with the necessary care in those observations; besides, I several times visited the Kew Observatory, through the kindness of Dr. Balfour Stewart, and took some observations of dip. At all times my first efforts were directed to have a firm support; next, to accurately levelling the instrument; third, to see that the agate plates were clean, that the axis of the needle was also clean and tested by the use of cork, that the needles were free from dust and damp, their ends being passed in and out of cork, and their surfaces wiped with wash-leather; and in damp weather increased attention was paid to everything; but, as a rule, observations were not made at such times; care was also had in determining the magnetic meridian corresponding, and in all cases several readings were taken in every position.

The results of observations of dip with local instruments at different places were as follows:—

Kew Observatory, monthly observations of dip with an instrument No. 33 Circle, of the same pattern I had made by Barrow; the length of the needle is about $3\frac{1}{2}$ inches. To compare No. 33 Circle with the Circle borrowed from Kew, I made simultaneous observations; the mean from six observations with two needles gave for No. 33 Circle=68° 2′·19, and for the Circle I had from Kew 68° 3′·8, this result being 1′·6 larger.

Royal Observatory, Greenwich.—Observations of dip are made frequently with Mr. Airy's dip instrument, described in the yearly volumes of observations at the Royal Observatory. Six needles of three different lengths are observed on the same instrument; the results derived from each separate needle seldom differ more than five minutes in the year. I took from the Royal Observatory observations the mean of the determined dip for the period from 1st July to 30th September, which was=67° 56′·15, derived from twenty-seven observations, and nearly corresponds to the time of my observations. The dip obtained from my observations with Kew Circle was =67° 58′·88, being 2′·73 larger.

Brussels Observatory.—The observations of dip were made with an instrument of old English construction, which was made in the year 1828,

by the English makers Troughton and Simms; two needles about 8 inches long are observed, and the observations are made in the usual manner, in the magnetic meridian. The dip is observed at the beginning of each year, in the month of March or April; thus for the year 1868 there was one observation made with two needles the 30th of March, and the dip obtained was 67° 11′·1. The 5th of September Professor Quetelet's son, according to my wish, was so kind as to observe the dip, and obtained almost the same result (that is, 67° 11′·0), whilst from observations with the Kew Circle I obtained the dip =67° 6′·77, being 4′·2 smaller.

Utrecht Meteorological Department.—The observations were made with an instrument not differing much from instruments of this class formerly used in England. It was constructed by Olland, a maker at Utrecht; the dip is observed every fortnight, in the middle and at the end of each month, with two needles about 8 inches in length. The results of the separate needles are very close to one another, and the dip is generally observed about 9 o'clock in the morning. Simultaneous observations were made by Mr. H. Welers Bethink and myself, each observing his own instrument. The dips obtained are as follows:—

With the Observatory instrument.... 67° 47′·7

With the Kew Circle..... 67° 43′·3, being 4′·4 less.

Vienna Meteorological Department.—The Dip Circle was made by Repsold, and a description of it is given in the 'Magnetische und meteorologische Beobachtungen zu Prag bei Karl Kreil, sechster Jahrgang, vom Januar bis 31. December 1845.' The instrument is provided with eight needles, whose lengths are about 9 inches each; the axis of the needle is perforated, and can be turned round the centre of the needle through a definite angle; each dip is deduced from eight separate sets of observations, by turning each time the axis of the needle through an angle of about 45°. The separate results derived in this way differ sometimes about 1° from each other, and the means for separate needles differ in some cases about 20′; so that the determinations of dip with this instrument are very uncertain, whilst the labour to obtain a pretty good result is very great; at the same time a single determination with one of the Barrow's Circles gives a result nearer to the truth. I must say here that the present Director of the Meteorological Institution in Vienna, Professor Yelynak, was so pleased with the instrument I had from Kew, that he asked me to order one for him of Mr. Barrow.

The mean result derived from the observations from January 1 to September 18, 1868, is =63° 32′·06; the result obtained with the Kew Circle is 63° 38′·80, being larger by 6′·7.

Munich.—Regular observations of absolute dip are not made at the Observatory. The last determined dip was in 1866, in September, and was 64° 16′·8. The dip for the present time is deduced from the variation of horizontal force and the constant relation between it and the dip as found by Dr. Lamont from a large series of observations; according to this the

dip for September 1868 is 64° 10′·9. The observed dip with the Kew Circle is 64° 7′·7, being smaller by 3′·2.

Paris.—The observations of dip at the Observatory are made with an instrument of Gambey regularly three times every day—that is, at 9 o'clock in the morning, at noon, and at 4 o'clock in the afternoon. This instrument gives only the variations of dip. To determine the absolute dip, a long series of simultaneous comparisons with a Dip-circle have been made. The following dip is deduced from observations with this instrument on the same days as my observations: it is =65° 45′·3; the result I obtained with the Kew Circle is 65° 49′·85, being 4′·5 larger.

These were all the stations at which I was able to make satisfactory observations; but as at most of these stations comparative observations at adjoint stations had been made before and the differences found between them, there was less need to extend my observations beyond the principal observatories.

Table II. contains the dips observed at the different stations before mentioned, and the differences between the local instruments and the Circle from Kew.

TABLE II.

September 1868. Stations.	Dips observed with local instruments.	Dips observed with Circle from Kew.	Local instruments—Kew Circle.
	° ′	° ′	′
Normal Observatory, Kew	68 2·19	68 3·80	−1·61
Royal Observatory, Greenwich ...	67 56·15	67 58·88	−2·73
Norwich.....	.....	68 17·86	
Brussels Observatory	67 11·00	67 6·77	+4·23
Utrecht, Meteorol. Department ...	67 47·70	67 43·30	+4·40
Vienna, Meteorol. Institution.....	63 32·06	63 38·80	−6·74
Munich Observatory	.....	64 7·70	
Paris Observatory.....	65 45·30	65 49·85	−4·55

I will now endeavour to deduce the most probable dips at each station. First I shall deduce the dip at Munich, as no observations are made there specially for dip, by taking the differences between the values I found at Munich and at every other station, and applying it to the result as found with the local instrument at each place. Thus the dip I obtained at Kew was 68° 3′·80, and at Munich was 64° 7′·70; the difference is 3° 56′·1; and applying this to the result as found at Kew by the Kew instrument 68° 2′·19, I deduce 64° 6′·09 as the dip for Munich; and treating all the other stations in a similar way I find:—

	° ′
Dip, from Kew..... =	64 6·09
,, Greenwich .. =	4·97
,, Norwich .... =	7·70
,, Brussels .... =	11·93
,, Utrecht .... =	12·10
,, Vienna..... =	0·96
,, Paris ..... =	3·15
Mean	64 6·70

And in a similar way I calculated the dips for all the stations, taking Utrecht first, because the dip found for Munich from this station gave a result differing from the mean the most of any; and then I treated Brussels in the same way, it being the next in order of discordance, and so on.

I thus formed Table III., giving the calculated dips, the observed dips with the local instruments and the Kew Circle, and the corrections for the Kew Circle.

TABLE III.

Stations.	Calculated Dips.	Dips observed with local instruments.	Dips observed with Circle from Kew.	Calcul.—Obs. with Kew Circle.
Kew	68° 1′·69	68° 2′·19	68° 3′·80	−2′·11
Greenwich ...	67 56·84	67 56·15	67 58·88	−2·04
Norwich.....	68 15·50	67 17·86	68 17·86	−2·36
Brussels	67 4·12	67 11·00	67 6·77	−2·65
Utrecht	67 41·37	67 47·70	67 43·30	−1·93
Vienna	63 36·73	63 32·06	63 38·80	−2·07
Munich	64 6·70	.....	64 7·70	−1·00
Paris	65 47·80	65 45·30	65 49·85	−2·05
			Mean	−2·03

This Table shows that the Circle from Kew gave at all stations the dip about 2′ too large; and only for Munich this difference is but 1′, which shows that the calculated dip for Munich is a little too large.

III. "On a New Class of Organo-metallic Bodies containing Sodium." By J. ALFRED WANKLYN, Professor of Chemistry in the London Institution. Communicated by Professor E. W. BRAYLEY. Received February 6, 1869.

Up to the present time organo-metallic bodies containing ethylene in union with the metal have been often sought, but never recognized.

I have to announce the existence of organo-metallic compounds of ethylene with the alkali-metals. In ethylate of sodium, or at any rate in the substance which is produced by heating up to 200° C. the well-known crystals got by acting on alcohol with sodium, I see the hydrated oxide of ethylene-sodium—

$$Na''' \left\{ \begin{matrix} (C_2H_4)'' \\ OH \end{matrix} \right.,$$

which, as I have recently shown, yields alcohol and a new compound on being heated with the ethers of the fatty acids: thus

Hydrate of ethylene-sodium. Acetate of ethyl. Acetate of ethylene-sodium.

$$Na''' \left\{ \begin{matrix} C_2H_4 \\ OH \end{matrix} \right. + \left. \begin{matrix} C_2H_3O \\ C_2H_5O \end{matrix} \right\} = Na''' \left\{ \begin{matrix} C_2H_4 \\ OC_2H_3O \end{matrix} \right. + C_2H_6O.$$